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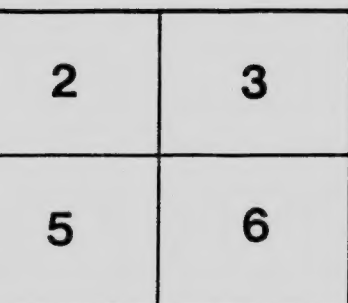
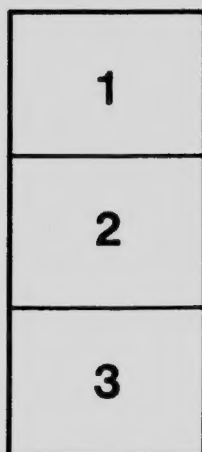
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PAMPHLET No. 24.

DOMINION OF CANADA.

CENTRAL EXPERIMENTAL FARM.

J. H. GRISDALE, B.Agr., D.Sc.A.,
Director.

W. T. MACOUN,
Dominion Horticulturist.

CONTENTS.

ASPARAGUS CULTURE.

CELERY CULTURE.

ONION CULTURE.

BY W. T. MACOUN,

Dominion Horticulturist.

ASPARAGUS CULTURE.

Asparagus has been under cultivation for at least two thousand years, but is still considered one of the most delicious vegetables. Being one of the first plants available for food in the spring, it is particularly popular with Canadians.

The wild asparagus (*Asparagus officinalis*), from which the cultivated varieties come, is an herbaceous perennial belonging to the Lily family and is a native of Great Britain and Europe. While in Great Britain it is found wild near the sea-coast, it is not restricted to such localities in Europe.

There are several named varieties of asparagus on the market, but less attention has been paid to the breeding of new sorts of asparagus than is the case with most other kinds of vegetables, and the distinguishing characteristics between the different varieties of asparagus are not very marked. There is a good field for the improvement of this vegetable.

Asparagus is usually propagated by seeds, although it is possible to propagate it by dividing the crown, though this method is much less satisfactory than raising plants from seeds, and it is not used in commercial planting. Seed should be saved from the earliest plants giving the largest stalks, and these should be marked during the spring or early summer. If this has not been done the seed may be taken from the strongest plants in the autumn. The seed is cleaned and kept dry through the winter and in the spring sown outside in a seed bed or in rows in the field. A convenient shaped bed is one about four feet wide. It may be any length desired. The soil in it should be good garden loam and of such a character that it will not cake. Drills are made across the bed about one foot apart and half an inch deep, the seed sown thinly in them and covered with soil. When grown in the field the rows may be made from fifteen to eighteen inches apart. A little radish seed which will germinate in a few days and mark the rows may be mixed with the asparagus seed as asparagus plants are not easily seen when coming up. The earlier in the spring the seed is sown after the soil is dry enough, the sooner will the seeds germinate and the longer season of growth they will have. As soon as the young seedlings are up the surface of the ground should be loosened and kept loose throughout

the summer to encourage as rapid a growth as possible. The plants should be thinned if very thick to from two to three inches apart. There should be fine strong plants by autumn. These are dug the following spring and the best selected for planting. In selecting, those with fewer and stronger buds are chosen in preference to those with more and smaller buds, as the former are likely to produce the thickest stalks. If the plants are bought it is well to get the best grade of one year old plants, although two year old plants are quite satisfactory also.

As the asparagus plantation may remain in one place for from twelve to fifteen or more years it is very desirable to choose a site where the soil is good and of considerable depth, for while annual applications of fertilizers will keep the asparagus in good condition in comparatively poor soil, the better the soil the better the average crop is likely to be. The old practice of trenching the soil and of burying great quantities of manure and even bodies of animals to make the soil very rich has, however, not been found necessary to obtain good asparagus. As early asparagus brings the highest price, it is important to choose warm, well drained soil, preferably with a southern exposure, so that growth will begin early. To prepare the soil for asparagus there should be a heavy application of well rotted barnyard manure deeply ploughed or dug under in the spring on land already under cultivation, and the ground thoroughly harrowed. Planting should begin as early in spring as possible. Trenches about eight inches in depth are opened up with the double mould board plough or spade. For garden culture the asparagus may be grown in beds if so desired, making the beds about four feet wide and setting the plants about eighteen inches apart in the bed. In field culture the trenches should be at least four feet apart, four and one-half to five feet is not too much. The rows should run as nearly north and south as possible. The distance apart which plants are set in the trenches varies with different individuals and runs all the way from $1\frac{1}{2}$ to 3 feet. At $1\frac{1}{2}$ feet apart it is not many years until the plants crowd one another, resulting in smaller stalks. At 3 feet apart, fine strong crowns will develop and stalks of the largest size be produced. It will be easier and cheaper to keep the plantation free of weeds and grass with the plants at the greater distance.

In planting, it is desirable to make a little mound at the bottom of the trench where each plant is to go, or at least to make the ground level so that the roots may be spread out over it. In many large plantations time is not taken to do this, although it would be profitable to do so. The plants are set very rapidly in the trench, drawing two or three inches of soil over them and pressing it well down. When the plants have made some growth more soil is drawn into the trenches when cultivating or hoeing and by the end of the first season the ground is nearly level and the crowns of the plants six or seven inches below the surface of the soil. During the growing season the soil should be kept level and free of weeds. The advantage of having the crowns of the plants well below the surface is that the ground may be cultivated early in the spring and manure worked in without injuring them. Furthermore, as the crown gradually works towards the surface as new growth is made on it from year to year it is desirable to start it well down. There is a disadvantage in having the crown too deep, however, in that the growth is delayed in the spring. This is especially true in the cooler clay loam soils, where shallower planting is desirable. Annual applications of manure will keep the soil in good condition and as it is important to have as strong plants as possible before any cutting is done it is advisable to mulch with short manure the autumn of the first year. This is worked into the soil the next spring. No cutting should be done the second season after planting, even though there should be some good shoots, but the ground should be kept well cultivated and free of weeds and mulched again in the autumn. A little cutting may be made from the stronger plants the third season, but it is best to leave most of the shoots to help build up strong crowns. In the fourth year cutting is begun in earnest and may continue for from six to eight weeks. The season of cutting should be shortened as much as possible as a long cutting season year after year will weaken the plants. In this and succeeding years it is desirable to manure

the summer after the last cutting has been made in order that the new growth may get the benefit of the available plant food so as to build up strong crowns for next year. Manuring in late autumn, as is often done, will keep the soil cooler longer in the spring and delay the growth. The manure should be spread between the rows in the summer rather than over the crowns, as the feeding roots run some distance from the crowns.

The value of salt for asparagus has been over-estimated. Sometimes good effects are noticed, and sometimes there is no apparent improvement from the use of it. An application of salt will lessen the amount of weeds and may liberate plant food. It also helps to hold moisture.

Where blanched or white asparagus is used the soil is banked up temporarily over the crowns in the spring so that the shoots have to come through a greater depth so as to give a shoot of sufficient length. The shoots are cut just as the tip is breaking through the soil. Blanching asparagus is little practised in Canada as the green shoots are generally used.

To cut asparagus, a knife should be used and the shoot severed just below the surface of the ground, taking care not to injure the crown or other shoots. When there is good growth it is necessary to go over the plantation every day. After cutting, the asparagus is bunched and in order to have the bunches of uniform size a small appliance called a buncher is used. The bunch is then tied and the butt ends squared off to make it neat. To have asparagus of the best quality it should be kept crisp and plump. To prevent wilting, the asparagus may be placed on damp sand or in water, or in a cellar until ready to take to market. When shipped a distance it is packed in crates, the bunches resting on damp moss.

The asparagus has no serious insect pests in the colder parts of Canada, but in southwestern Ontario the common *Asparagus Beetle* and the *Twelve Spotted Asparagus Beetle* are quite troublesome. There are two broods of these beetles in a season. The beetles of the first brood injure the young shoots and lay their eggs on them, while the larvæ later on feed on the foliage. These insects pass the winter as fully developed beetles. The remedies recommended are the following:—

(1) *Dusting with lime*.—The most effective remedy is probably the destruction of the larvæ by dusting the plants systematically every three or four days with fresh air-slaked lime, which adheres to their slimy bodies and kills all those with which it comes in contact.

(2) *Poisoning*.—A spray mixture of powdered arsenate of lead, 2 pounds to 40 gallons water, will destroy both the larvæ and the perfect beetles which eat the poisoned foliage, if applied every week or ten days.

During recent years the *Asparagus Rust* has been a serious menace to asparagus culture, although it has not proved as troublesome in Canada as in some parts of the United States, where it has been very injurious. This disease has three distinct stages. In the spring the disease grows and develops spores on shoots which are not cut in either cultivated or neglected plantations or on individual plants in the vicinity. It is the second, summer or rust stage when the disease is most apparent, causing the leaves to turn yellow and then brown. During these stages spores are given off from slits in the stems of the asparagus in large numbers and the disease spreads with great rapidity. During the summer spores of another character are formed which carry the disease over winter. These are known as the winter spores. The disease, thus prematurely destroying the tops which would otherwise be storing up reserve food in the crowns, causes a weakening of the latter and if the disease is severe for several seasons in succession will ruin a plantation.

As many of the winter spores are carried over on the diseased tops these should be cut and burned, as in this way the disease may be checked somewhat. The best known remedy is sulphur. This should be applied in the fine form known as flowers of sulphur. It should be thoroughly dusted over and through the plants before the

rust makes its appearance in summer. Two applications at intervals should be made. As the asparagus plant is smooth and the dry sulphur does not adhere well to it, it is advisable to spray the plants with whale oil soap and water before applying the sulphur. About 150 pounds of sulphur per acre will be needed for each application. Bordeaux mixture has not given satisfactory results on the whole.

As some varieties of asparagus are not so subject to rust as others it is well to plant those which are most immune, amongst these being the Argenteuil and Palmetto, and a variety recently developed by the Department of Agriculture of the United States. The Conover Colossal is one which is most affected.

CELERY CULTURE.

Celery is much relished by many people and it is desirable that the methods by which good celery may be grown should be generally known in Canada.

Soil.—Celery is a moisture-loving plant and to have good celery it is necessary to provide it naturally or artificially with a liberal quantity of water during the growing season. A soil should, if possible, be chosen where dry weather will not affect the celery, as if checked in its growth it will not be as good as it would otherwise be. The muck soils are very popular for celery growing, as the supply of moisture from below is usually plentiful and constant. Moreover, these soils are easier worked and celery can be grown with less expense in them. Celery grown in muck soils does not keep so well as that grown in rich, friable sandy loam which, if it is sufficiently moist, is perhaps the best for celery. Not only does celery require a good supply of water to make it grow rapidly, but it should also have a liberal amount of available plant food. This is obtained by giving the soil a top-dressing of from 15 to 20 tons or more per acre of manure in the autumn, which may be ploughed under then if there is danger of leaching, or left until spring. A good plan is to plough under fresh manure in the fall and give a top-dressing of well rotted manure or chemical fertilizers in the spring which may be turned under with the gang plough or disced in. The ground should be loosened to a depth of five or six inches. The disc harrow and smoothing harrow are then used and the ground thoroughly mellowed and levelled. It is desirable to roll the land before the plants are set out.

Growing the Plants.—Celery seed loses its germinating power very soon and for that reason care should be taken in obtaining fresh seed from a reliable source. The seed should be ordered early and its germinating power tested before the time of sowing. If early celery is desired the seed should be sown during the month of March in a hotbed or, if desired, in the house. For late celery the seed is sown about the middle or during the latter part of April. The seed may take two weeks to germinate, hence care should be taken to keep the surface soil constantly moist from the time the seed is sown until it comes up. The seed is very small and should be sown quite shallow, being just nicely covered with soil. A good plan is to sow the seeds broadcast and sift a little loam over them, this being then pressed down. If the seed is sown in the house the soil should have good drainage. A good plan to ensure the surface always being moist is to keep a cloth or blotting paper on the surface of the soil until the seeds germinate when the plants should be given light gradually. The young plants grow slowly. Some prefer sowing the seed thinly and thinning the plants where they stand instead of transplanting, but many growers prefer transplanting as the root system of the plants is then much better when they are set out. When the seedlings are about two inches high they are transplanted to about two inches apart each way in the hotbed or cold frame. If the plants become spindly before it is time to set them out, about half of the top may be cut off. The early celery is planted out during the month of May when danger of severe frost is past, and the later celery in June or even as late as July.

Planting.—After rolling the soil as stated before, the land is marked out in rows about four feet or more apart. If the celery is blanched with boards or other blanching material, three feet is sufficient. Planting should be done during cloudy or wet weather or when the ground is quite moist. The plants should be set firmly in the soil as the late celery, especially, being planted during hot weather will suffer unless the planting is carefully done. The average distance apart of the plants in the row is five to six inches. Some growers prefer planting in a double row with the plants six or seven inches apart, four or five feet being left between each double row. The old plan of digging out a trench about a foot wide and eight to ten inches deep and mixing manure with the soil in the bottom of it and setting the plants in the trench is not now practised except by amateurs. Where a small quantity is grown it is still one of the easiest methods of growing celery as the stalks can be readily covered with soil, resulting in a well blanched celery of good quality. Another plan practised by some growers is to make trenches with the double mould board plough, put manure in, mix it with the soil in the bottom and close up and level down the trenches and plant the celery on top.

Cultivation.—As soon as possible after planting, the ground is cultivated and thorough cultivation is kept up until the celery is moulded up. It is of the utmost importance to keep the plants growing well throughout the season. Shallow cultivation is desirable as the celery is not a deep rooted plant and it is important not to injure the roots. Furthermore, deep cultivation will loosen the soil below many of the roots, causing the soil to dry out there and thus checking the growth of the celery. The importance of keeping the plants growing thriftily may also be emphasized by stating that sometimes when plants are checked in growth during a dry time they will throw up flower stalks and the celery will be ruined. This applies particularly to early celery. Hollow or pithy stalks are usually the result of a check in the growth of the plant, although it has been found that it is sometimes due to inferior strains of seed.

Blanching.—Celery is blanched to make it crisp and tender and to lessen its strong flavour, which is unpleasant when it is green. When the celery has grown tall enough to make good stalks it is time for blanching. The very large growers of celery use comparatively little hand labour in preparing the plants for blanching, merely moulding up the soil about the plants with a plough especially made for the purpose. Those most anxious to have the best celery, however, go over each plant by hand, breaking off suckers and weak outside stalks, then drawing the stalks of the plant together and holding them in position by packing soil about the plant. This may be begun when the plants are about six inches high. This work is done very rapidly. The rest of the work is now done with the spade or plough, or both, piling up the soil well about the plant, merely leaving the top leaves and especially the crown or central part of the plant exposed. This moulding up should not be done when the soil is very wet as it would be likely to stick to and discolour the plants.

Early celery is now very generally blanched by means of boards or by a pliable blanching material somewhat resembling "ready roofing" which is taking the place of boards, which while perhaps not giving celery of quite as good quality as if blanched by soil give very satisfactory results. Boards one inch thick and twelve to fourteen inches in width are the most suitable kinds of boards. They are placed on each side of the row and brought up as close to the plants as possible and are held in place either by stakes or strips nailed or hooked across the boards. A little soil is thrown up along the base of the board to prevent the light getting in that way. Early celery will blanch in from two to three weeks when boards or other blanching materials are used. For home use celery may be blanched with good results by using four inch tiles, which are placed over the plants. Celery blanched in this way is clean and of good quality.

Celery for late use is not blanched in the field except where the climate is mild enough to leave it outside until used. It is, however, often gone over once to remove the suckers and weak outside stalks and banked up a little to hold the plants in place.

Storing Celery for Winter.—The best way to keep celery is to dig it up during the month of October or before severe frost and store it in a dark, cool, well ventilated cellar which is not wet but yet not too dry. Before storing, some of the outer leaves may be removed and the roots shortened a little, if they are very long. It is not necessary to leave the soil on the roots if the plants are stored at once after digging, although if there is plenty of room it is better left on. The celery should be replanted in soil in the cellar, the roots only being covered with soil. The celery is set in rows and, as ventilation between the plants is important, laths may be used for separating the rows with good effect, unless there is room to plant them far enough apart that air can readily pass between. If the cellar is very dry and the celery needs watering during the winter, arrangements should be made for watering without wetting the tops, as wet tops will cause rotting. Celery could be kept outside and used when wanted if protected from frost, but great care would have to be taken and ventilation afforded, for if the tops were covered with soil or any other material the celery would be liable to rot. If no cellar is available the celery might be better protected outside by digging it up and replanting closer together in a pit, the top of which could be covered with boards. Where the amount of moisture in a cellar can be well regulated celery may be stored on shelves or racks, tier upon tier, but by this method there is danger of the celery losing its crispness unless close attention is paid to keeping the roots sufficiently moist.

Varieties.—In parts of Canada where the summers are comparatively cool and short, the White Plume, the earliest variety, is well thought of but is inferior in quality to the Golden Self Blanching (Paris Golden Yellow) which is the best early sort in most sections. For winter, Giant Pascal, French Success, Evans Triumph, and Winter Queen, are all good.

Celery is usually little injured by insect pests, but much damage is often done by the Celery Blight or Rust, and the Leaf Blight. The former disease is particularly troublesome in dry seasons and in dry soils, and to avoid it moist soils should, if possible, be chosen. Small, yellowish or grey spots on the leaves are the first indication of the disease. These gradually spread until they meet. The leaves eventually turn yellow and afterwards brown, the plant becoming much weakened. The disease known as Leaf Blight affects all parts of the celery above ground. The characteristics of this disease are watery patches on the stems and leaves. Small, black dots appear on these from which the spores are given off. These re-infect the plant and cause the disease to spread. This disease is also carried by means of the seed, hence seed should be used which is clean. Both the Celery Blight and the Leaf Blight can be controlled by thorough applications of Bordeaux mixture in the proportion of 4 pounds bluestone, 4 pounds lime and 40 gallons of water. Spraying should be begun when the plants are in the seed beds and the plants kept covered with the mixture until the cooler and moister weather of early autumn.

Rotting of the heart in storage is induced by lack of ventilation, too warm a cellar, and by watering the plants from above. These conditions should be avoided to lessen this trouble.

ONION CULTURE.

Soil and Cultivation.—The best soil for onions is a rich sandy loam, but they will also succeed in clay loams and in muck. It is important to have clean land to save labour in destroying weeds. Onions required a large amount of available plant food in the soil and it should, therefore, be made very rich beforehand by the application of barnyard manure. The best practice is to apply rotted manure in the autumn and plough it under, from forty to sixty tons per acre not being considered too much to obtain the best results. If it cannot be applied in the autumn well rotted manure may be worked into the surface soil early in the spring, but the manure should be thoroughly incorporated with the soil or the latter may dry out, and it would be difficult also to

sow the seed properly. The surface soil should be thoroughly pulverized and made as fine and level as possible before sowing the seed. The seed should be sown just as early as it is possible to get the land into condition, as onions need a long season of growth to bring them to maturity. Owing to the looseness of the soil in many parts of the prairie provinces it is better to plough in the autumn so as to have the soil as compact as possible when the seed is sown, thus ensuring prompter germination. Onions are sown much more satisfactorily with a seed drill than by hand, as the seed is sown more evenly and the soil being pressed down by the roller of the machine is left in better condition for the germination of the seed. It is important to have good seed as it is very disappointing to have a poor stand of onions, and for this reason the seed should be tested before being sown by putting it between the folds of a piece of moist cotton or blotting paper in a saucer with another saucer inverted over it to maintain moisture. If one hundred seeds are tested the percentage may be readily calculated from the number that germinate. The seed should be kept in a warm room. Another reason for sowing only the best seed is to avoid thick-necks, which are more common when poor seed is sown. The seed should be sown about half an inch deep in rows 12 to 14 inches apart, from four to six pounds of seed per acre being required. If maggots are usually troublesome the seed should be sown thicker than it otherwise would be. It is needless to say that the straighter the rows are the easier it will be to cultivate or hoe afterwards, but the marker which is attached to the seed drill will ensure the rows being fairly straight. As soon as the plants have grown sufficiently for the rows to be seen, cultivation should begin and the surface of the soil kept loose. As soon as the plants are large enough to work with easily, which will be when they are from 3 to 4 inches high, they should be thinned to from 1 to 2 inches apart, but it is best to leave them a little on the thick side. After thinning, the soil should be at once cultivated, shallow cultivation being desirable, and the surface henceforth kept loose during the growing season to destroy weeds and promote the rapid development of the onions. It is important to destroy the weeds when they are young in order not to disturb the onions, which will be done in hoeing or pulling large weeds. Onions are ripe enough to pull when the tops have dried down about one half. As soon as the onions are ripe they should be pulled, from four to six rows being thrown together and turned occasionally until they are dry enough and firm. They may be topped as soon as convenient after they are dry. As soon as they are dry they should be stored in a cool, well ventilated place where they will not be exposed to much frost. To get good ventilation it is desirable to put the onions in crates. Two of the best varieties of onions are Large Red Wethersfield and Yellow Globe Danvers. Southport Yellow Globe is a popular variety in the warmest sections. Early White Barletta and White Queen are small early varieties suitable for pickling. For the prairie provinces or where the season is short the Extra Early Red or Early Flat Red give better results as a rule.

The seed of the large onions of the Prize Taker type and others should be sown in hotbeds in rows about four inches apart, and the young plants afterwards planted in the field, taking the precaution before setting out to harden the plants off by giving more ventilation. These transplanted onions grow much larger than they would if the seed were sown outside. In parts of Canada where the season is short it is desirable to transplant even the smaller varieties to ensure their maturing well.

Onion sets or Dutch sets.—These will ensure a good crop of onions when other kinds fail, and are particularly useful where the seasons are short. They are planted three inches apart in rows twelve inches apart. Sets one-half of an inch in diameter or under, should be used. Egyptian or Top Onions are very hardy. Bulblets instead of seed form on top of the flowering stalk, and these are used for planting like sets for an early crop of green onions. They live over winter outside in most places where they are grown in Canada. Multiplier and Potato Onions instead of forming a single large bulb break into many small bulbs which are used for raising early crops of green onions. The Potato Onion is very hardy.

Raising Onion Sets.—Onion sets are much used in Canada, especially for obtaining early green onions. The set is a small, immature onion, dried off in summer. To raise onion sets the seed should be sown very thickly, preferably in poor, warm and sandy soil, the object being to prevent the onions from developing much, and to induce them to dry off in the summer before they are mature. If the seed is sown thickly enough the sets may be raised on good soil. If raised in good soil there should be at least 200 seeds to the foot to ensure the sets being the right size, and to have them dry up or ripen thoroughly. As much as 100 pounds of seed per acre should be used to be fairly certain of good results. If the sets are more than one-half of an inch in diameter, seed stalks are likely to be thrown up, and the bulb will not develop; but if most of the sets are one-half inch in diameter, or under, the bulb will develop, and there will be no seed stalk during that season. The seed should be sown very early in the spring in rows about 12 inches apart. The seed of the Yellow Globe Danvers is mainly used for this purpose, but the large Red Wethersfield, or Extra Early Red, may also be used. The small immature but dried up bulbs which should be harvested as soon as ripe, if kept in good condition in a dry, well ventilated place, will soon begin to grow when they are planted in the spring.

Diseases.—The onion has few diseases, and there is but one which need be mentioned here, namely, the Onion Blight, or Mildew, which often causes serious loss. This Onion Blight is a parasitic fungus which spreads by means of spores in summer, and is carried over winter on the leaves; hence these should be destroyed in the autumn. The spores are so numerous that it does not take long for a large area to become affected. It has been found that the disease spreads most rapidly in damp, warm, close weather, the spores germinating very rapidly under such conditions. Over low lying ground the air is moister than over elevated land, and the disease is usually worst there. Spraying with Bordeaux mixture has been recommended, but the disease is very difficult to control. Once the spore has germinated and the disease entered the leaf, it is not possible to reach it by spraying; hence, if spraying is to be effective, it is necessary to spray early enough to kill the spores as they germinate.

Injurious Insects.—The insect most injurious to onions is the Onion Maggot. The eggs which produce this maggot are laid by a slender fly somewhat smaller than a house fly. The eggs are laid on or about the stems of the young onion plants near, or on, the ground. In a few days maggots hatch, and work down into the soil, where they lie near the root, or burrow into it, feeding on the sap and soon destroying the onion. The injury occurs throughout the season, but is most noticeable in June. There is no entirely satisfactory remedy for this pest. A remedy which has given fairly satisfactory results in some cases is Hellebore, 2 ounces to 1 gallon of water poured about the roots, at intervals of a week from the time the young plants appear until the onions are well developed. Another remedy which has been very successfully used, and is becoming more popular each year is $\frac{1}{2}$ oz. of commercial sodium arsenate dissolved in a gallon of boiling water to which is added one pint of cheap molasses. This is sprinkled over the plantation once a week during the early part of the season. A whisk can be used for sprinkling small areas. The object is to have large drops of the material well distributed over the plantation. The female flies feed on it and are killed, and are thus prevented from laying the eggs from which the maggots hatch. This is considered the best known remedy.





